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AUTHOR OLIVIER, KENNETH S., JR.
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ABSTRACT

DATA COLLECTION AND REDUCTION PROCEDURES USED IN THE SYSTEM FOR THE ANALYSIS OF CLASSROOM COMMUNICATION (SACC) ARE PRESENTED. THE SACC IS A SYSTEM DEVISED FOR THE SYSTEMATIC OBSERVATION OF VERBAL AND NON-VERBAL CLASSROOM BEHAVIOR. CODERS EMPLOY DATA SHEETS WHICH CONTAIN NUMBERED CELLS FOR RECORDING BEHAVIOR AT FIVE SECCND INTERVALS. EACH SHEET CONTAINS 180 NUMBERED CELLS AND FIFTEEN MINUTE SESSIONS CAN BE RECORDED ON A SINGLE DATA SHEET. THE RECORDING OF BEHAVIOR IS FACILITATED BY A TIMING DEVICE WHICH ELICITS A CLICK AND A FLASH OF LIGHT EVERY FIVE SECONDS. WHEN AN OBSERVATIONAL SESSION HAS BEEN RECORDED THE DATA FROM THE CODING FORMS ARE TABULATED ON TALLY SHEETS AND SUMMED TO OBTAIN CATEGORICAL FREQUENCY TOTALS. AFTER TABULATION OF FREQUENCY TOTALS THE DATA ARE TRANSFERRED TO THE SUMMARY SHEET. THE PROCESSES INVOLVED IN DETERMINING THE SCOTT COEFFICIENT OF INTER-OBSERVER AGREEMENT FROM THESE DATA ARE DESCRIBED. (AUTHOR/RSM)

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CENTER FOR THE
STUDY OF
EVALUATION
UCLA
Graduate School
of Education
Los Angeles, California

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Kenneth S. Olivier, Jr.

CSE Working Paper #5
December 1969

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Users of the System for the Analysis of Classroom Communication (SACC), which was devised for the systematic observation of verbal and non-verbal classroom behavior, employ data sheets which provide a numbered cell for recording behavior at five-second intervals (Tables 1 and 2). Each sheet contains 180 numbered cells. Fifteen-minute classroom sessions can be recorded on a single data sheet; several sheets will ordinarily be used for a single classroom session. The recording of behavior at five-second intervals is facilitated by a timing device (described in CSE Working Paper No. 4) which emits a click and a flash of light every five seconds, and at the same time displays the number of the cell to be coded. Coding procedures are described in Working Paper No. 2. A coding session is a coherent classroom instructional unit which should be of 20 to 30 minutes duration.

After initially meeting with the classroom teacher to explain the observational procedures, observers assume inconspicuous positions in the rear of the classroom. When an observational session has been recorded, the data from the coding forms (Tables 1 and 2) are tabulated on tally sheets (Tables 3 and 4) and summed to obtain categorial frequency totals. Each category symbol on the coding form is transferred to the appropriate category on the tally sheet as an hatch mark. After tabulation of frequency totals, the data are transferred to the summary sheet (Table 5). The processes involved in determining the coefficient of inter-observer agreement (π) from these data are briefly described below.

The Scott coefficient (π) is an informal statistic that has been widely used to estimate inter- and intra-observer agreement in the field (Scott, 1955). The coefficient is usually based upon frequency data but can be modified to show the amount of time for each category of observed behavior. This method of estimating agreement corrects for the number of categories used and is unaffected by low frequencies in any category. It can also be used for data expressed in terms of percentages.

The Scott coefficient represents the relationship between the percentage of observed agreement, P (the percentage of judgments in which two observers agree when coding the same phenomena independently), and the percentage of agreement to be expected by chance (P_e).* According to Scott, the expected P_e is the sum of all squared proportions for all categories, since the coders' probabilities of using any one of the categories are equal.

To facilitate the training of coders, two graphs, developed by Flanders, are utilized; one for estimating P_e and the other for estimating π. The short-cut method for estimating P_e employs slide rule computation and includes the following steps:

(1) From the original coding sheets (Tables 1 and 2), record the data for each observer on separate tally sheets (Tables 3 and 4).

(2) Enter the frequency for each category on the summary sheet (Table 5), in the appropriate observer's column (1 or 2). Sum these columns and compute the percentage for each category by dividing the individual category frequency by the sum of tallies for that observer. Multiply by 100 and enter this percentage separately for each observer in the appropriate observer's columns (3 or 4) in Table 5.

(3) Compute the percentage difference for each category by subtracting the smaller proportion from the larger and enter these numbers in the DIFF (%) column (5) of Table 5.

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*Flanders (1967) has transformed Scott's original concept of P_e to a percentage estimate by multiplying the sum of all squared proportions by 100.

$$P_e = 100 \sum_{i=1}^{k} p_i^2$$

where k = the total number of categories possible, and p_i = the proportion of tallies which fall in the i^{th} category. π is the amount by which two observers exceed chance agreement when coding independently.

(4) Sum the percentage difference over all categories and subtract this sum from 100 to obtain P_o (proportion of observed agreement). For the sample observation (Table 5), $P_o = 61.8\%$.

(5) An estimate for P_e may be obtained by using the graph shown in Figure 1. First, compute the average percentage for both coders for the two largest categories (see Table 5: category 5_4 has the highest average percentage of tallies (20.8%) and category 6_2 contains the second highest percentage of tallies (18.1%). On Figure 1, locate the line representing the highest category (by interpolation, 20.8% is about one-tenth the distance between the lines labeled 20% and 30%). Next, on the abcissa, locate a vertical line representing the magnitude of the second-largest category (by interpolation 18.1% is 3/5 of the distance between the lines labeled 15% and 20%). The intersection of these two lines is at the point marked X on Figure 1. The estimate for P_e is 15%, read off on the ordinate.

(6) In Table 5, P_o is 61.8% and the estimate for P_e is 15%. An estimate for π can now be obtained by using Figure 2. A vertical line corresponding to P_e of 15 (abcissa), and a horizontal line (ordinate) corresponding to P_o of 62, intersect at a point about midway between $\pi = 0.75$ and $\pi = 0.80$ (X on Figure 2). For this particular observational session, $\pi = 0.78$. This estimate of π is accurate enough for practical purposes.

Calculation of these statistics is sufficiently quick and easy to encourage observers to complete them after each day's observations. During training it is essential to do it immediately and to plot the results on a daily chart so that progress in learning the coding procedures can be followed.

REFERENCES

Flanders, N.A., Interaction analysis in the classroom: A manual for observers. In A. Simon & E.G. Boyer (Eds.), Mirrors for Behavior. Vol. 2. Philadelphia, Pa.: Research for Better Schools, 1967.

Jones, M.H., Reliability of coding of the system for the analysis of classroom communication (SACC). Los Angeles: UCLA Graduate School of Education, Center for the Study of Evaluation, Working Paper No. 2. November, 1969.

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Table 1

8/1/69

X

1

X

X X

X X

X X

✓	3_1	A_2	16_2		A_2		16_2	1_1 5_2	6_2
i_1			T_2		1_1		6_2	✓ 5_2	16_2
A_1	✓		16_2		1_1		16_2	✓	T_1
A_1	A_1		16_1		A_2	✓	T_2	1_1 3_1 A_2 ✓	16_2
✓									

		25				28		29	
31		33				34		35	
						46		47	
49		50				52		53	
						58		59	
								65	
						70		71	
						76		77	
								83	

Table 2

SAGE CODING FORM

D. TE 8/1/69

TIME X

CODER 2

ETHNIC GROUP X

SCHOOL X PAGE X

GRADE X X

No. of Pupils

SUBJECT X

TEACHER X SEX X

✓3₁ 4₂ 1	6₂ 2	5₂ 3	/6₁ 4	1₁ 5₂ 5	6₁ 6₂ 6
1₁ 7	6₂ 8	1₁ 9	6₁ 10	1₁ ✓ 5₂ 11	/6₁ 12
4₁ ✓ 13	/6₁ 14	1₁ 15	/6₂ 16	✓ 17	/T₁ 18
4₁ ✓ 19	/6₁ X 20	4₂ ✓ 21	/6₂ 22	1₁ 3₁ 5₂ ✓ 23	/6₂ 24
25	26	27	28	29	30
31	32	33	34	35	36
37	38	39	40	41	42
43	44	45	46	47	48
49	50	51	52	53	54
55	56	57	58	59	60
61	62	63	64	65	66
67	68	69	70	71	72
73	74	75	76	77	78
79	80	81	82	83	84
85	86	87	88	89	90
91	92	93	94	95	96
97	98	99	100	101	102
103	104	105	106	107	108
109	110	111	112	113	114
115	116	117	118	119	120
121	122	123	124	125	126
127	128	129	130	131	132
133	134	135	136	137	138
139	140	141	142	143	144
145	146	147	148	149	150
151	152	153	154	155	156
157	158	159	160	161	162
163	164	165	166	167	168
169	170	171	172	173	174
175	176	177	178	179	180

Table 3

Sample TALLY SHEET

TEACHER X

DATE 8/1/64

CODER 1

OBSERVATION # 1

Categories	# Tallies	Frequency
1_1	𝍸	5
1_2		0
2_1		0
2_2		0
2_3		0
3_1	II	2
3_2		0
4_1	III	3
4_2	IIII	4
5_1		0
5_2	II	2
5_3		0
5_4	𝍸 II	7
6_1	II	2
6_2	𝍸 II	7
6_5		0
7_1	I	1
7_2	II	2
7_5		0
8_1		0
8_2		0
9_1		0
0_1		0

Categories	# Tallies	Frequency
a_1		0
a_2		0
a_3		0
a_4		0
a_5		0
b_1		0
b_2		0
b_3		0

Table 4

Sample TALLY SHEET

TEACHER X

DATE 8/1/69

CODER 2

OBSERVATION # 1

Categories	# Tallies	Frequency
1_1	𝍸 I	6
1_2		0
2_1		0
2_2		0
2_3		0
3_1	II	2
3_2		0
4_1	II	2
4_2	II	2
5_1		0
5_2	IIII	4
5_3		0
5_4	𝍸 III	8
6_1	𝍸 I	6
6_2	𝍸 I	6
6_5		0
7_1	I	1
7_2		0
7_5		0
8_1		0
8_2		0
9_1		0
0_1		0

Categories	# Tallies	Frequency
a_1		0
a_2		0
a_3		0
a_4		0
a_5		0
b_1		0
b_2		0
b_3		0

Table 5

Sample [illegible] SHEET

RECORDER X

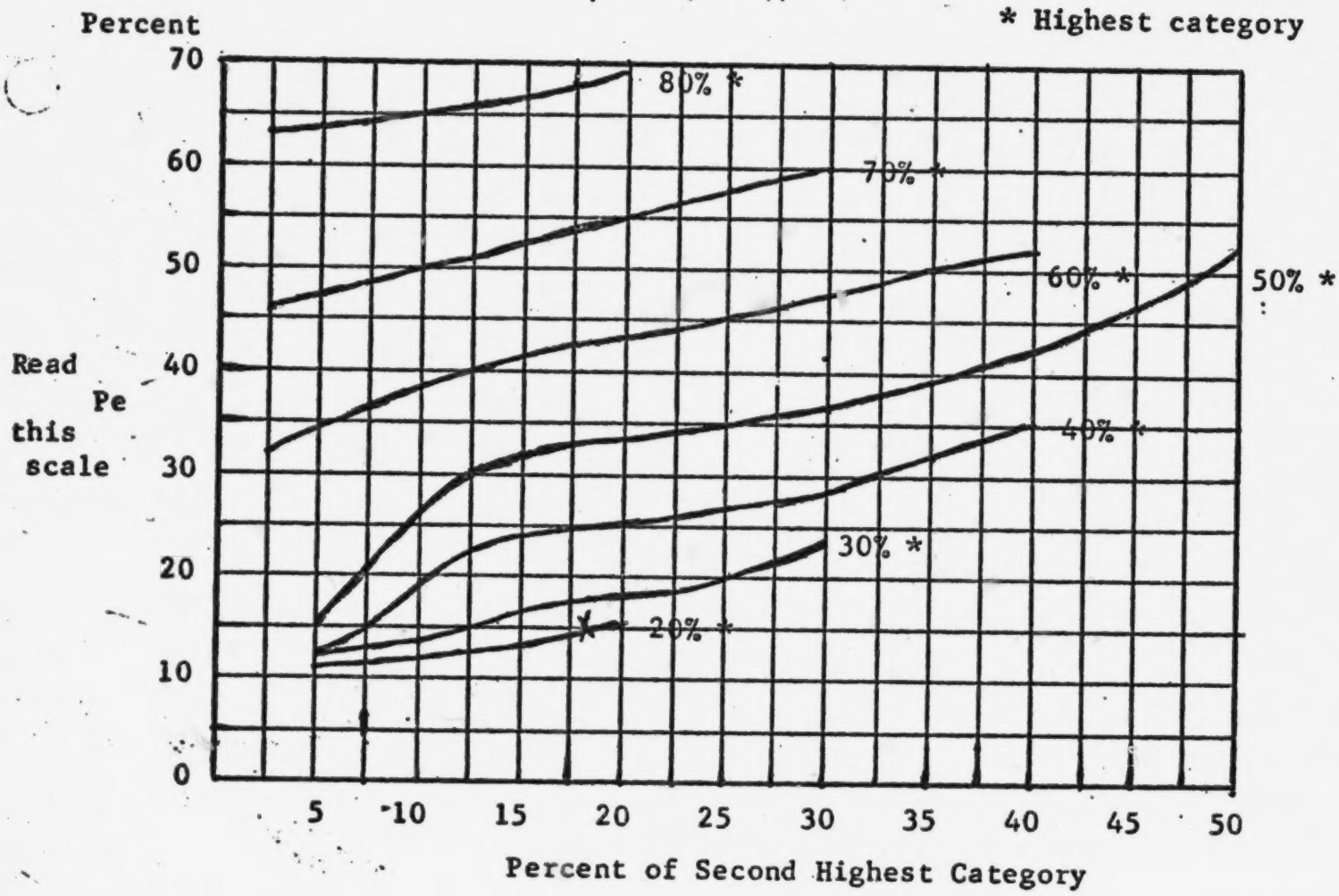
DATE 8/1/69

CODERS 1 and 2

Categories	Frequency		Percent					
	Observer 1 (1)	Observer 2 (2)	Observer 1 (3)	Observer 2 (4)	DIFF (%) (5)	Mean Percent Two Largest Categories (6)	Mean Time (Seconds) (7)	Mean Percent Time (8)
1	5	6	14.30	16.20	1.90		19	16.5
2	0	0	0	0	0			
3	0	0	0	0	0			
4	0	0	0	0	0			
5	0	0	0	0	0			
1	2	2	5.72	5.41	.31		6	5.2
2	0	0	0	0	0			
3	3	2	8.57	5.41	3.16		10	8.7
4	4	2	11.40	5.41	5.99		10	8.7
5	0	0	0	0	0			
1	2	4	5.72	10.80	5.08		10	8.7
2	0	0	0	0	0			
3	7	8	20.00	21.60	1.60	$\frac{20.00+21.60}{2}=20.8$		
4	2	6	5.72	16.20	10.48		8	15.7
1	7	6	20.00	16.20	3.80	$\frac{20.00+16.20}{2}=18.1$	32	27.8
2	0	0	0	0	0			
5	1	1	2.86	2.70	.16		5	4.3
1	2	0	5.72	0	5.72		5	4.3
2	0	0	0	0	0			
5	0	0	0	0	0			
1	0	0	0	0	0			
2	0	0	0	0	0			
1	0	0	0	0	0			
2	0	0	0	0	0			
1	0	0	0	0	0			
2	0	0	0	0	0			
3	0	0	0	0	0			
4	0	0	0	0	0			
5	0	0	0	0	0			
1	0	0	0	0	0			
2	0	0	0	0	0			
5	0	0	0	0	0			
SUM	35	37	100	100	38.20		115	100
T	36	36	$\bar{T}$ = Ave. No. Tallies		P_o = 100 − 38.20 = 61.80		est. P_e =	15
N	25	25	N = No. of cells					
C. =	10	C = 9	ΣC = 10 (Total categories				est. σ =	0

Figure 1

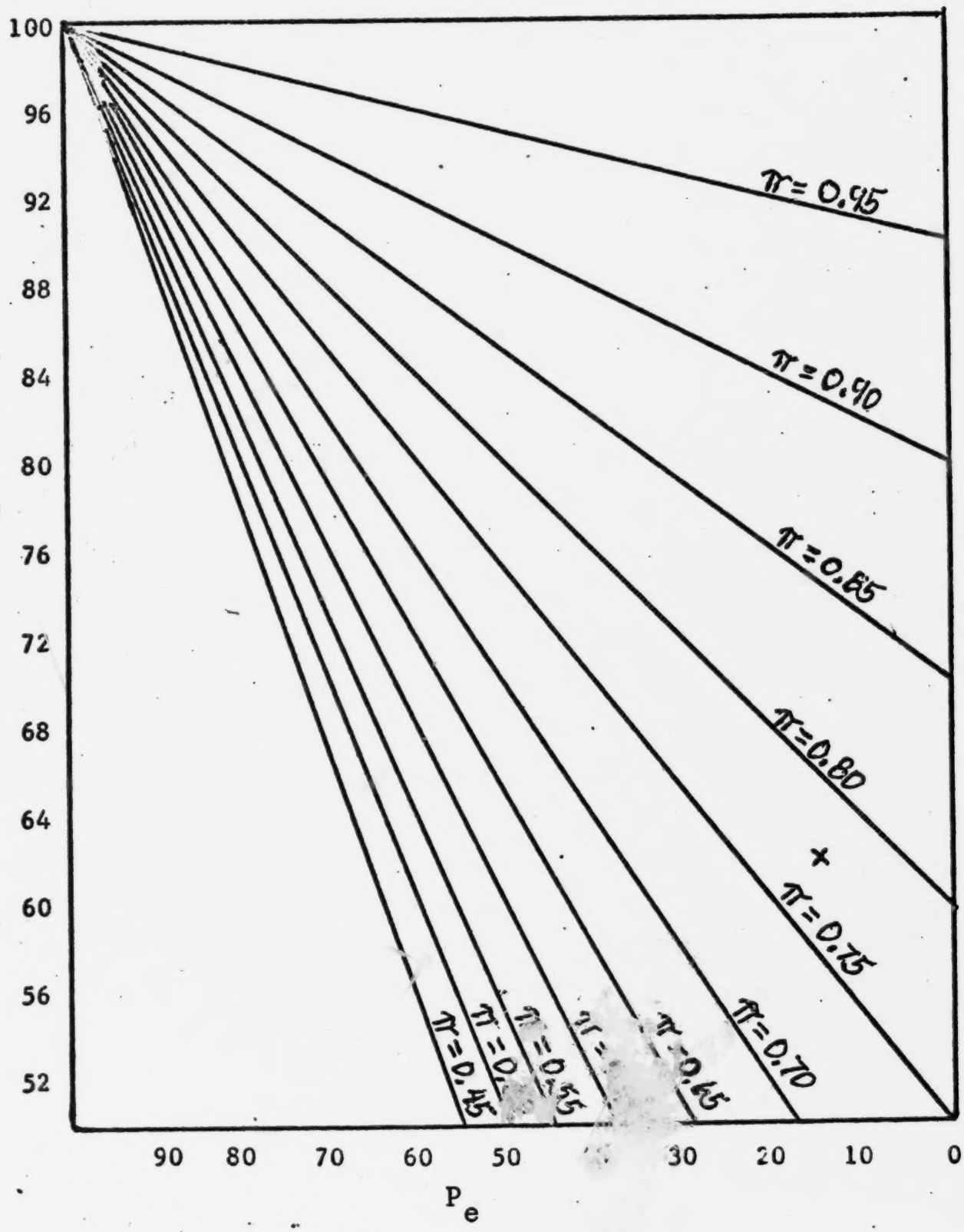
ESTIMATION OF P_e*



*Adapted from Flanders (1967)

Figure 2

ESTIMATION OF π COEFFICIENT



*Adapted from Flanders (1967)